

Writing Functions

In first term we learned that all lines are of the form: $y = mx + b$

Which we will now write as $f(x) = mx + b$

When doing applications - we tend not to call it 'slope' instead: we call it "rate of change"

Some other terms:

Interpolate: to use a graph to predict a $f(x)$ value from a selected x

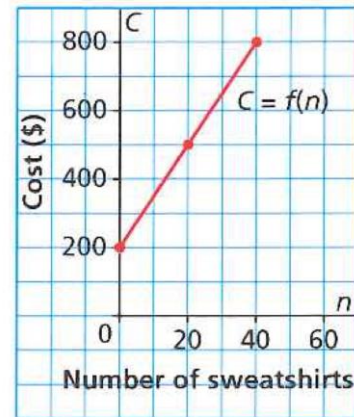
Extrapolate: to extend a graph using the pattern shown to predict a $f(x)$ value for a future x

What assumption do you make if you "extrapolate" *that the same pattern will continue (context dependent)*

Important - Don't assume the graph counts by 1 – identify your axis scale first

Example:

The graph shows a school fundraiser - sweat shirts were sold with the school's logo - a killer whale on the back. The cost in dollars C is shown as a function of the number of shirts sold (n)



a) What is the rate of change of this function?

What does it represent?

$$m = \frac{300}{20} \text{ or } 15 \text{ \$/sweatshirt}$$

Represents the cost of each sweatshirt

b) What error do you see in this graph?

Why might it have happened?

This is a discrete function – points shouldn't be connected. Scale of axis filled area between points

c) Create a formula for this function using function notation

$$C(s) = 15s + 200$$

d) Use your function to determine the number of sweat shirts bought for \$700

$$700 = 15s + 200 \quad 500 = 15s \quad s = 33.33 \quad \text{so they could buy 33 sweatshirts}$$

e) Use your function to extrapolate the cost of

i) 220 shirts

ii) 455 shirts

$$C(220) = 15(220) + 200$$

$$C(220) = \$3500$$

$$C(455) = 15(455) + 200$$

$$C(455) = \$7025$$

What issues might exist in extrapolating this graph? Can you make ∞ sweatshirts?

Explain the y-intercept of \$200? Likely a set-up cost for printing

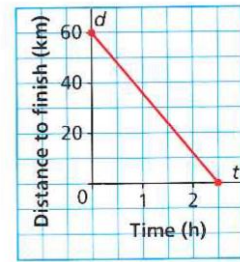
2) The graph shows the distance to the finish line for a dog sled race near Pelly Bay. $D = \text{km}$, $t = \text{hours}$

a) What is the rate of change of this function?

What does it represent?

$$m = \frac{-60}{2.5} \text{ or } -24 \text{ km/h Sled speed (negative shows they are moving toward finish line)}$$

Dogsled Race



b) Create a formula for this function using function notation

$$D(t) = -24t + 60$$

c) How long did it take to reach the $\frac{3}{4}$ point of the race?

$\frac{3}{4}$ means travelled 45 of 60 km so 15 km left approx: 1.8 hours

d) How far had the sled travelled after 45 minutes?

$$D(0.75) = -24(0.75) + 60 \quad D(0.75) = 42 \text{ km so sled has travelled 18 km}$$

3) The graph shows the distance in miles from Josh's house vs the time that Josh travelled in his car

a) What does the y-intercept represent?

Where Josh is now (160 miles from home)

b) What does the x-intercept represent?

Time to get home (4 hours)

c) What is the rate of change of this function? What does it represent?

$$m = \frac{-160}{4} \text{ or } -40 \text{ mi/h car speed}$$



d) Create a formula for this function using function notation

$$J(t) = -40t + 160$$

e) How far had Josh travelled after:

a) 45 minutes?

b) 2 hours 15 minutes?

$$J(0.75) = -40(0.75) + 160$$

$$J(0.75) = 130$$

Travelled 30 miles

$$J(2.25) = -40(2.25) + 160$$

$$J(2.25) = 70$$

Travelled 90 miles

4) You are having a fundraiser for a school trip - you purchase 340 pens for 56¢ each. Your plan to sell them for \$2.00. Create a formula for your fundraising profit as a function of pens sold.

y-intercept: $(340 \times 0.56) = -190.40$ (you are down 190.40 before you start selling)

rate of change: \$2

$$C(p) = 2p - 190.40 \quad (\text{need to sell 96 pens to start making a profit!})$$

ASSIGNMENT = Worksheet

F(x) = mx + b Revisited Worksheet

1) Each graph shows the altitude 'A' in feet of a small plane as a function of time in minutes 't'

i) Determine the rate of change of each graph

a) _____ b) _____

ii) State the domain and range of each graph

a) D: _____ b) D: _____

R: _____ R: _____

iii) Create an equation (using function notation of each graph

a) _____ b) _____

iv) Use your function to extrapolate to find the altitude at 11 mins.

a) _____ b) _____

2) The 4 graphs display the temperature in °C as a function of time in hours at different locations.

a) Determine the rate of change of each graph

i) _____ ii) _____

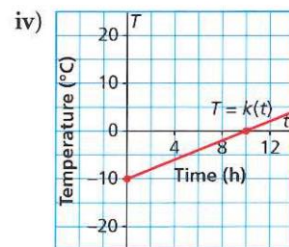
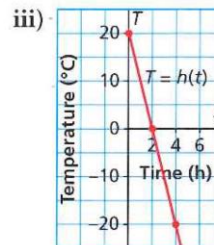
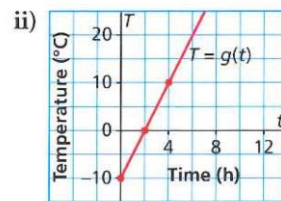
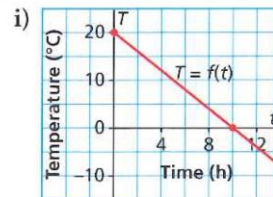
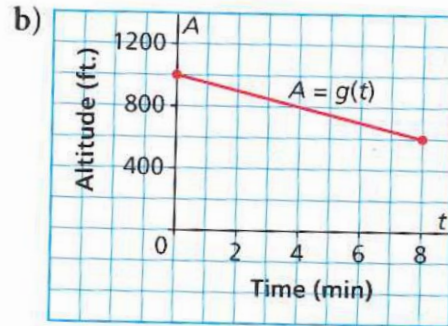
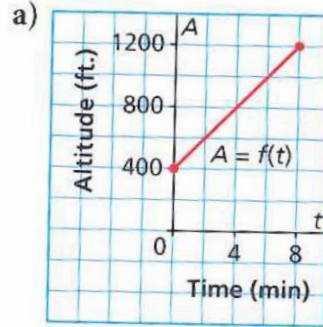
iii) _____ iv) _____

b) Create an equation of each graph (using function notation)

i) _____ ii) _____

iii) _____ iv) _____

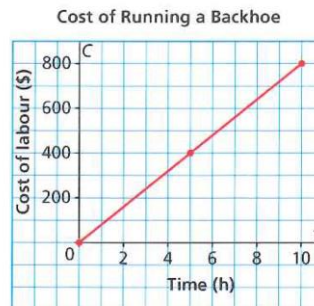
c) Why can you not extrapolate these graphs to ∞ ?



3) The graph shown, displays the cost of running a backhoe versus hours used

a) Determine the rate of change of the graph

b) Create an equation of the graph (using function notation)



c) Use your equation to find the cost of running the backhoe for

i) 7 hours ii) 15 hours iii) 58 hours

Why might the above (iii) not be true?

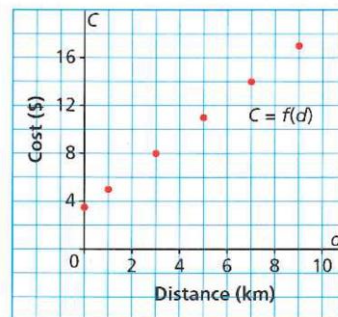
d) How many hours could you run the backhoe if you had

i) \$360 ii) \$950 iii) \$2360

Why might the above (iii) not be true?

4) The graph shows the cost 'C' in dollars to rent a cab as a function of distance travelled in 'km'

a) Determine the rate of change of the graph, and what does it represent?



b) Create an equation of the graph (using function notation)

c) Use your formula to find the cost of a:

i) 7 km ride ii) 156 km ride

iii) Why might the answer to (ii) not be true?

d) How far could I go if I had \$340 to spend?

e) Why do you think this was graphed as a discrete function?

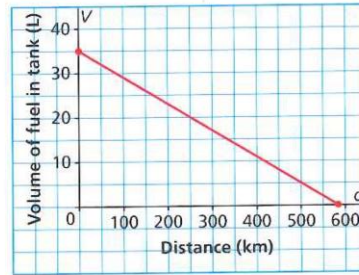
5) The fuel consumption of a smart car and SUV are shown in the graphs to the right. Both cars were driven from full tanks of gas to a point where the tanks were nearly empty.

a) Determine the rate of change of the graph, and what does it represent?

Smart car

SUV

Fuel Consumption of a Smart Car

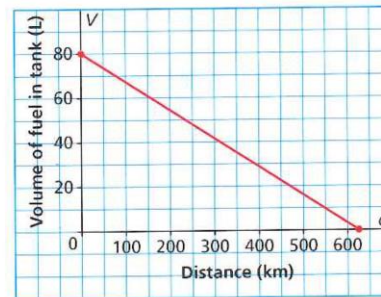


b) Create an equation of each graph (using function notation)

Smart car

SUV

Fuel Consumption of an SUV



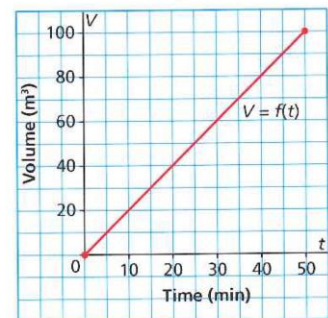
c) Use the graphs to explain which vehicle is more economical to drive - state any assumption you may make or problems that might exist in your argument.

6) The graphs show the time to fill (Graph A) and the time to empty (graph B) a 100 L cylindrical storage tank

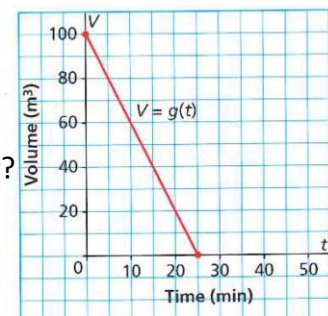
a) Which process takes longer? How do you justify your answer to this question

b) Create a formula for each graph shown using function notation

Graph A



Graph B



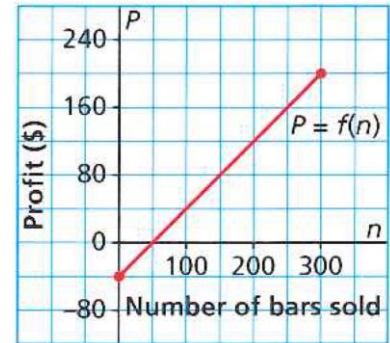
c) If the tank was shaped as a cone - do you think the graph would be linear? Why or why not?

7) A school is trying to raise money so that they can go on a band trip to Tuktoyaktuk! They ordered and are selling 300 chocolate bars as shown in the graph

a) Why is the y-intercept negative?

b) How many bars did they need to sell to break even?

c) What is the rate of change of the graph? What does it represent?



d) Create an equation in function notation for this fundraiser

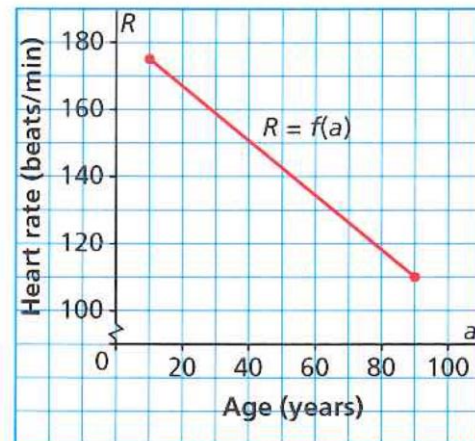
e) If they had added 40 cents to their selling price how much more could they have made?

f) Why can't you use the same equation if they had purchased 500 bars?

8) The graph shows the recommended heartrate of a person R as a function of their age.

a) Why does the graph not have intercepts?

b) What is the rate of change of the graph



c) Create an equation for this graph and state the fixed domain

d) Use your function to find the recommended heart rate for a person of age

i) 72

ii) 54

iii) 16